

From Subterranean Saltwater to Fresh Water A “New” Approach Town of Hull and the Weir River Basin

Water Resource Management Conference

**Presented By
Gary L. Smith P.G.
Senior Project Manager Hydrogeologic Services
Wright-Pierce Inc.**



Communities Applying Innovative Approaches

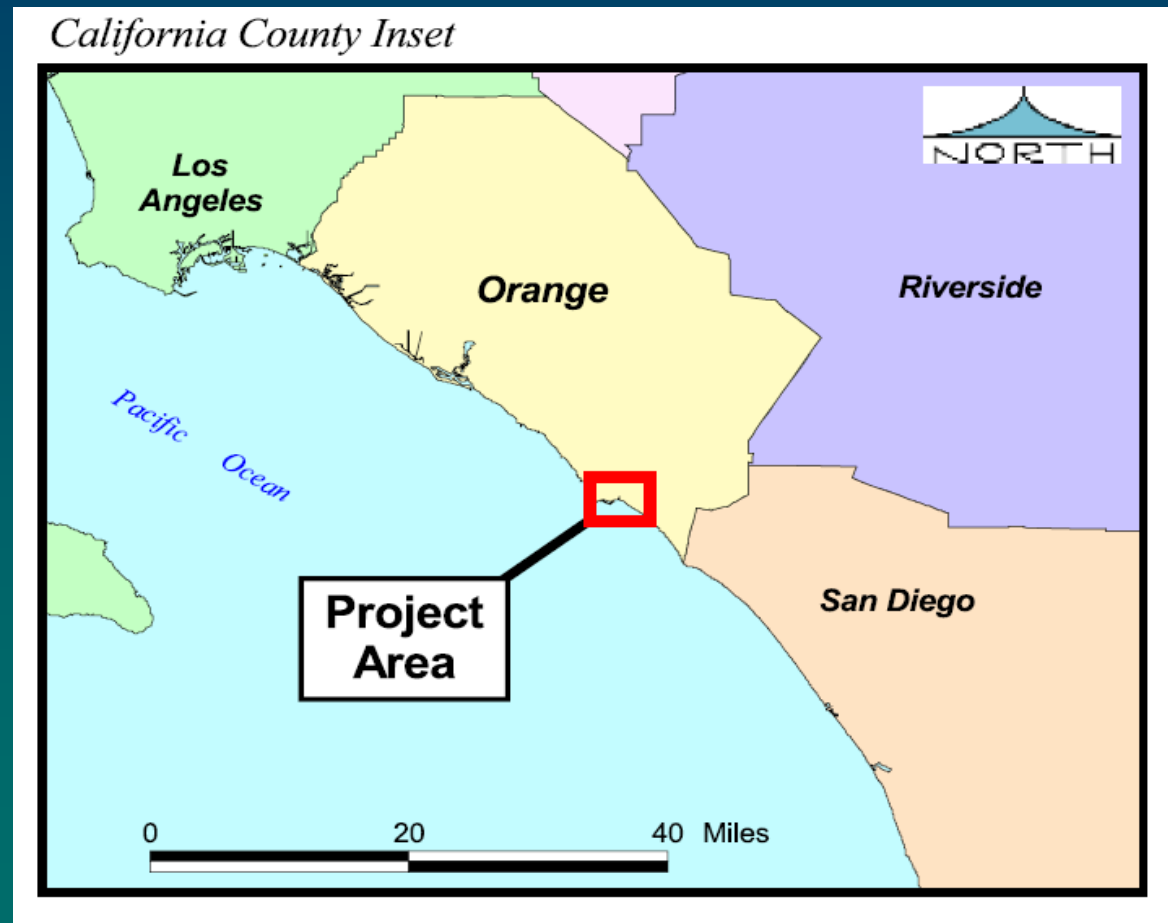
- Hull Massachusetts
- Orange County CA. Water District
- Seabrook, New Hampshire
- Bethlehem, New York

Project Locations



Project Location

Orange County California Water District



Aquifer Located Beneath Hudson River, Bethlehem NY

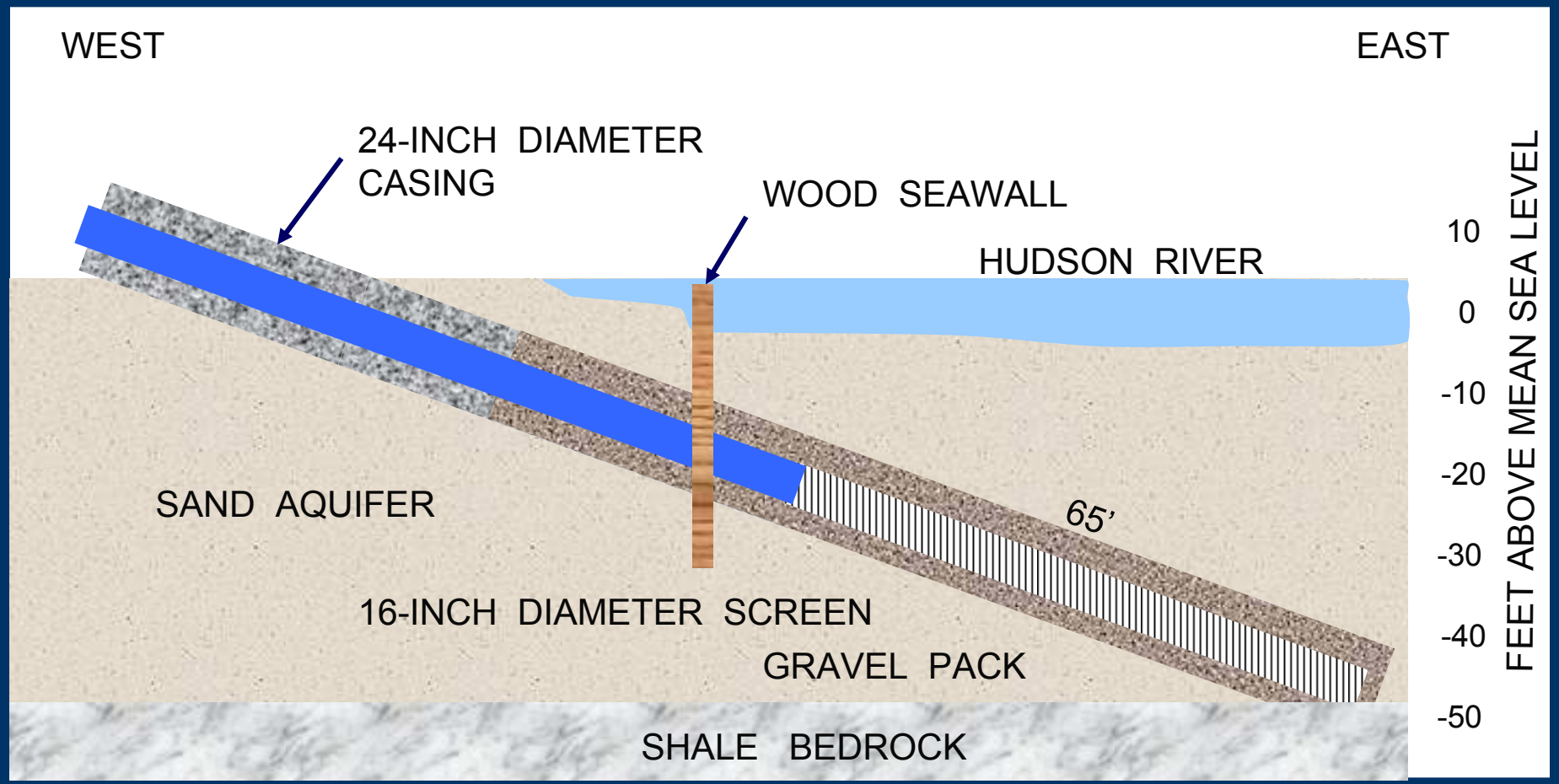


Angle Well Drilling





Angle Well Drilling Beneath Hudson River



5 MGD Pump Test

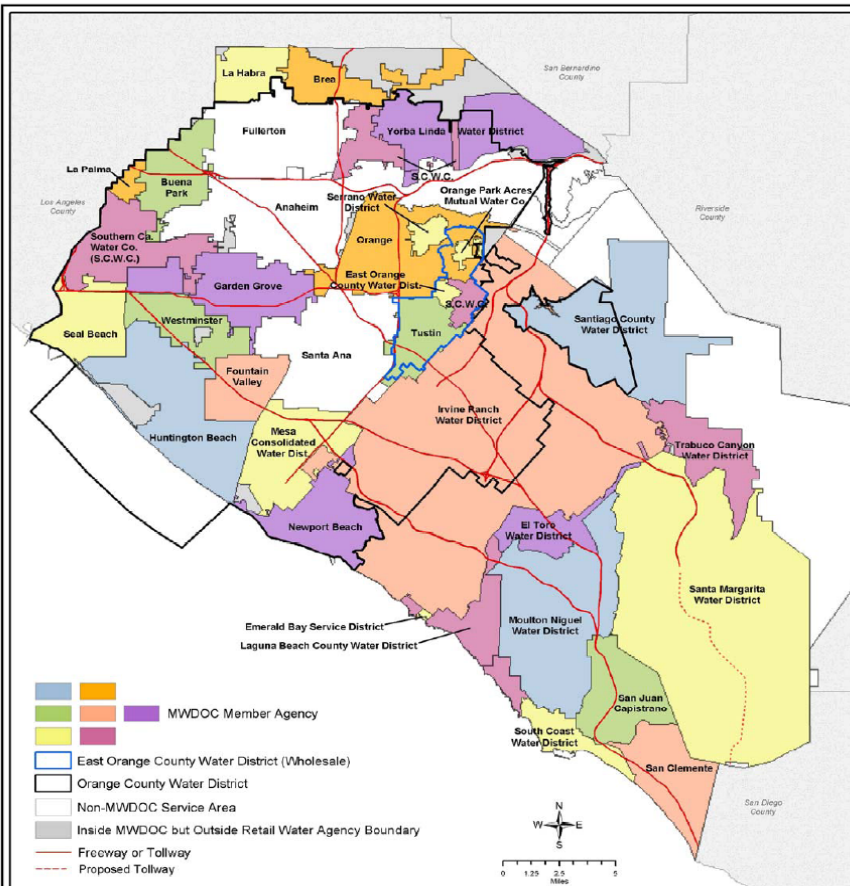


Increased Well Yield

	Specific Capacity gpm/ft/dd	Pumping Rate gpm
Vertical Gravel Well	17	250
Angle Gravel Well	46	696

MWDOC

Serves 24 Cities 625 MGD



MWDOC Service Area and Member Agencies



Center for Demographic Research, September 2004.
Portions of this map are copyrighted, and reproduced with permission granted, by THOMAS BROS. MAPS

Orange County Water Facts

700,000 acre-feet of
water per year

- North/Central County
 - Groundwater
 - Imported water
 - Recycled water
- South County
 - Imported water
 - Recycled water
 - Limited groundwater



Municipal Water District of Orange County California

Challenges to Colorado River

- Growth in other basin states
- Over allocation
- Impact of drought
- Mexico
- Water quality



West Coast To East Coast Similar Problems

Challenges to Northern California Water

San Francisco Bay/
Sacramento - San Joaquin
River Delta

- Hub of State's water system
- Degraded ecosystem
- Water quality issues
- Supply impacted by endangered species
- Long-term stability of levee system



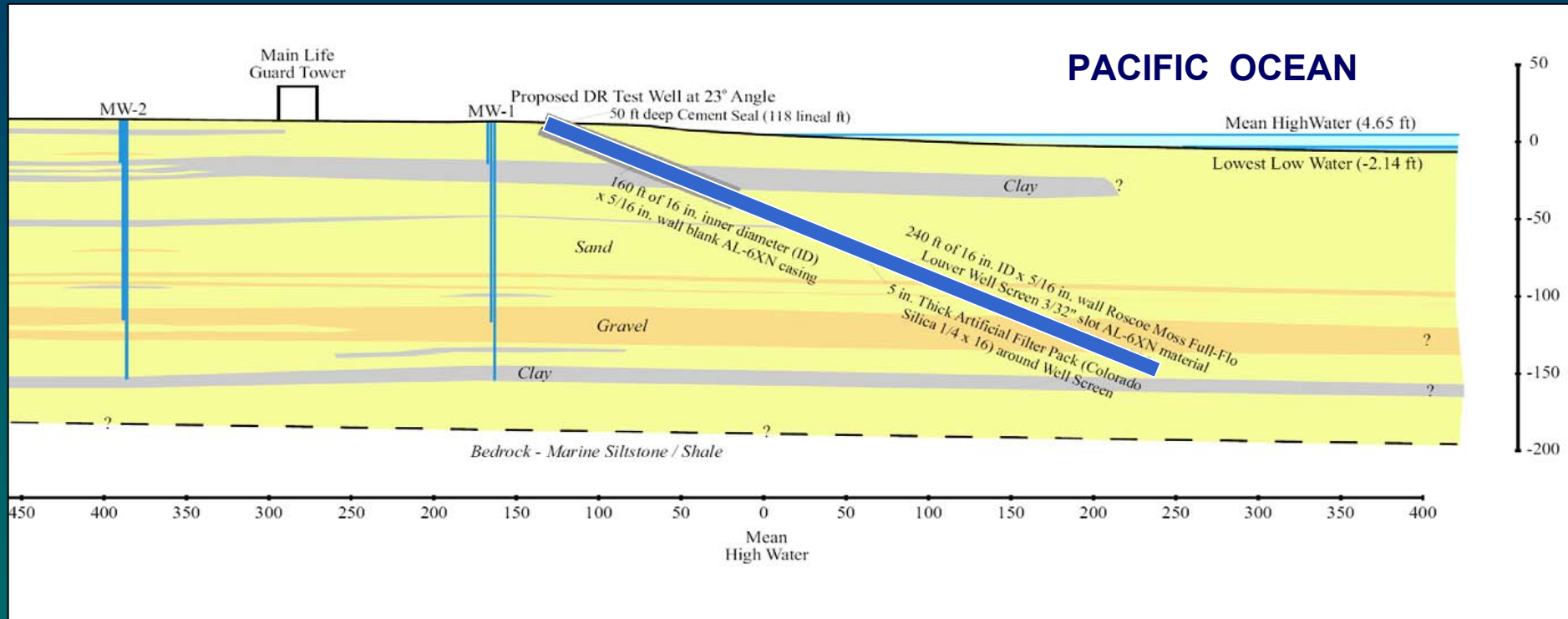
Angle Well Drilling For Filtered Pacific Ocean Saltwater

MUNICIPAL WATER DISTRICT OF ORANGE COUNTY

DANA POINT OCEAN DESALINATION PROJECT



23° Angle Beneath Ocean



Seabrook, NH

- **Municipal Owned System**
- **Groundwater Supplies**
- **Average Daily Pumpage 1.61 mgd**
- **Summer Daily Pumpage 2.53 mgd**

Seabrook, NH

Local Setting



Barrier Beach



TOWN LAND
MAP NO. LOT 2 20-23-22

LEGEND

- EM SURVEY LINE
- EXISTING BORING

SCALE (feet)
0 200 400

ATLANTIC OCEAN

AREA 1

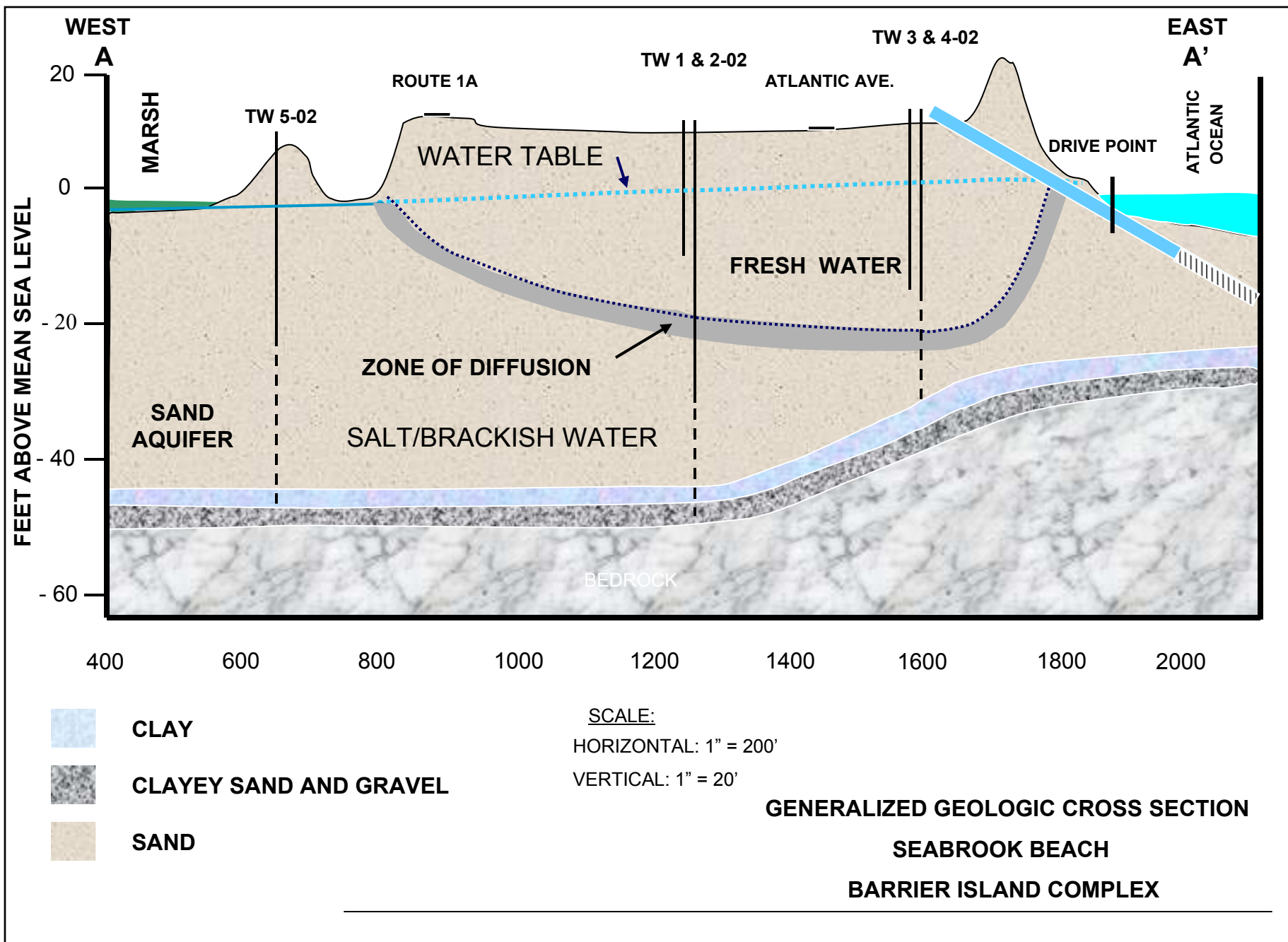
AREA 2

Apparent Conductivity (mmho/m)
0 10 20 30 40 50 60 70 80 90 100

US ROUTE 1A
LINCOLN ST
MAIN ST
HIGH TIDE LINE
LOW TIDE LINE

Test Well Pumping Water Quality Sampling

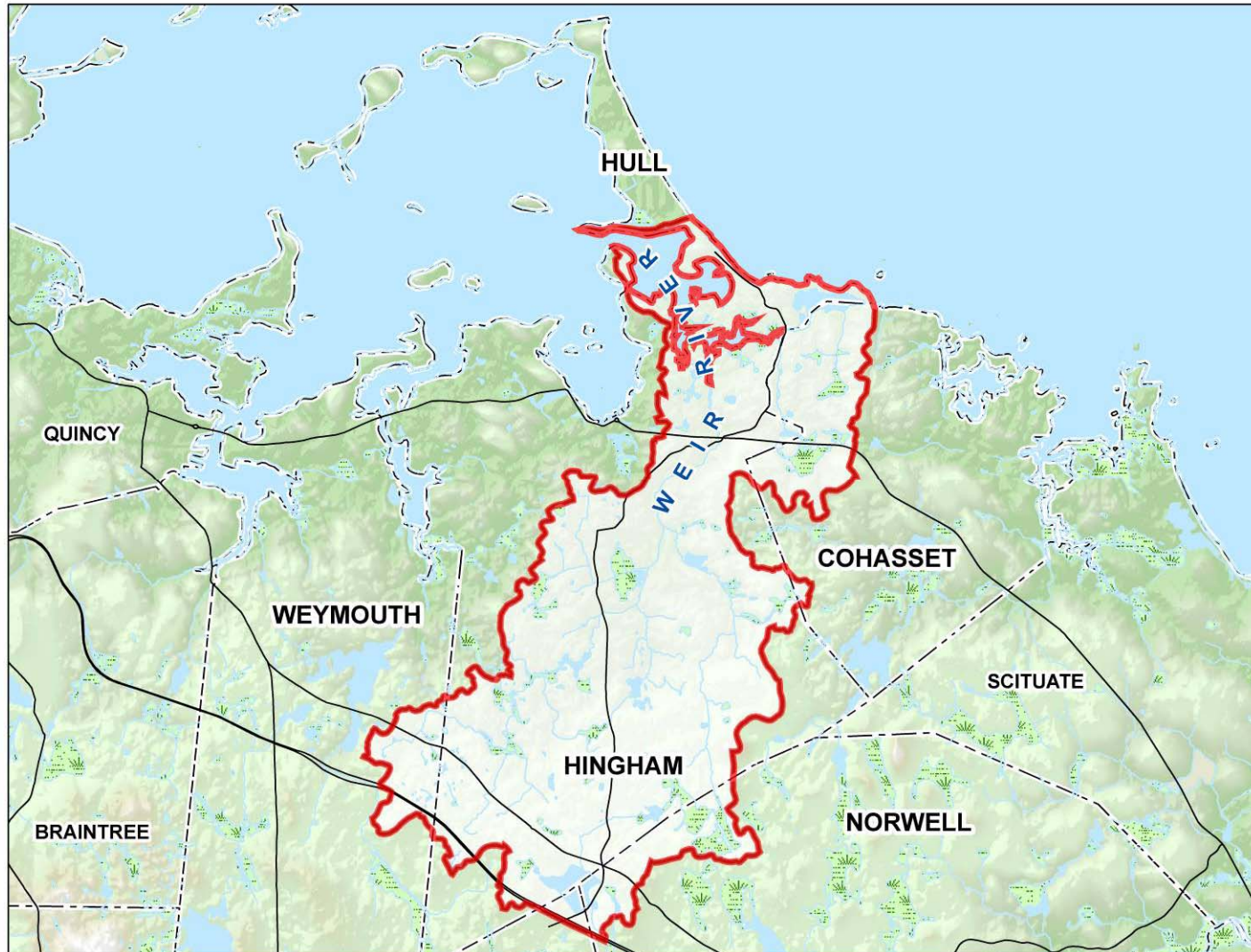




Hull Water Supply

- **Hull Served by Aquarion Water Co. of Massachusetts**
- **Surface and Groundwater Supplies**
- **Hull/Cohasset August 2005 Avg. Daily 4.353 MGD**

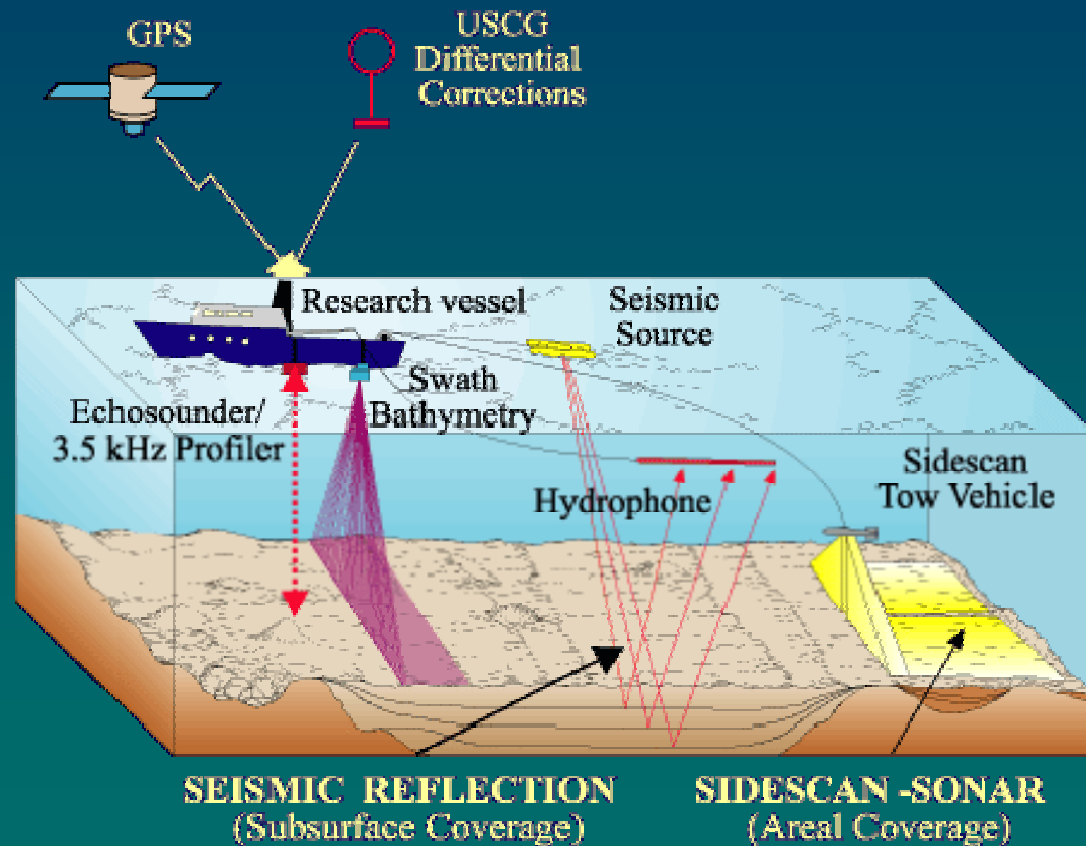
Town Of Hull & Weir River Watershed

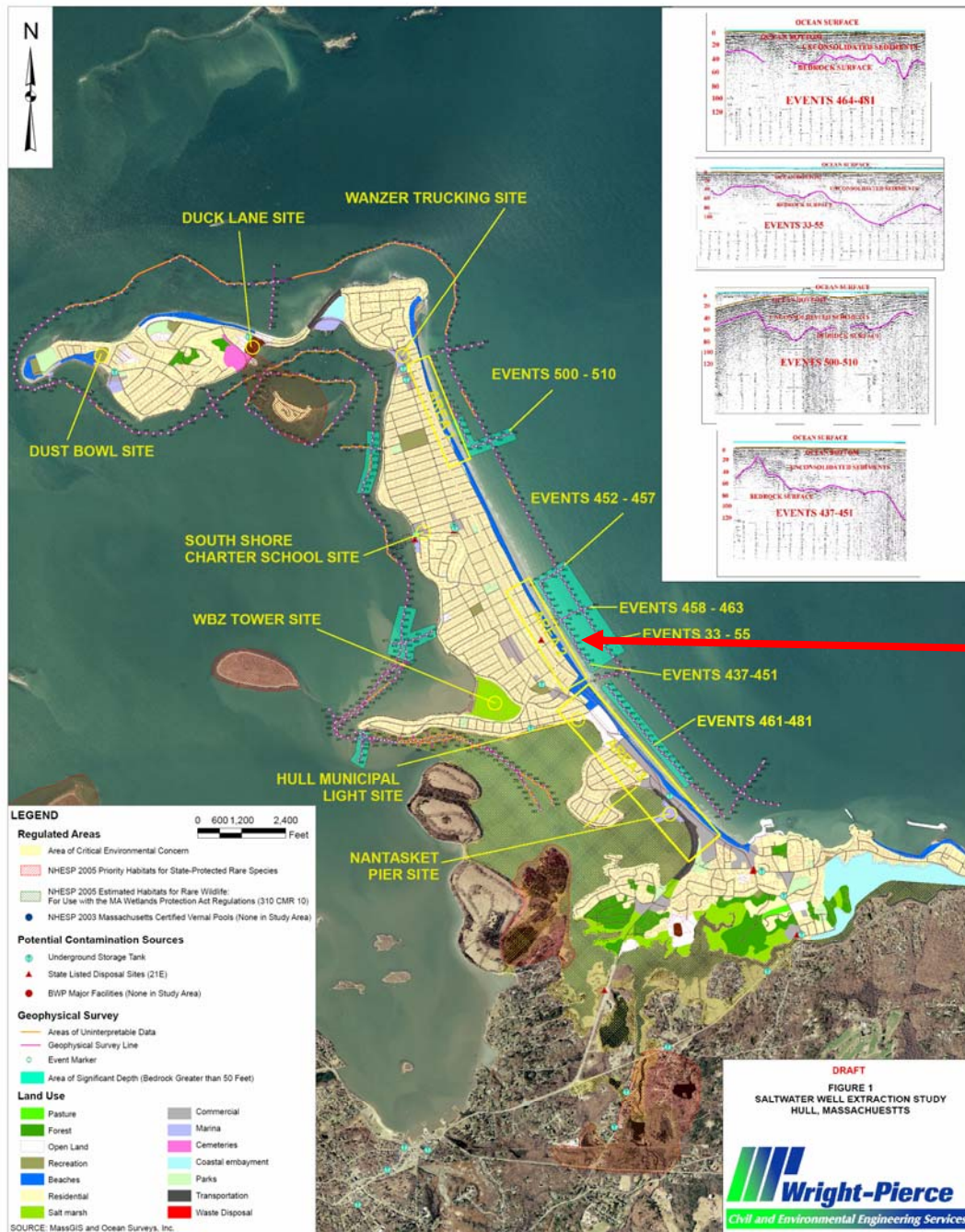


Hull Peninsula



Marine Seismic Reflection





- 18 Miles Seismic Line
- 120 Foot Deep Buried Pre-Glacial Channel
- Channel Filled With Sand and Gravel

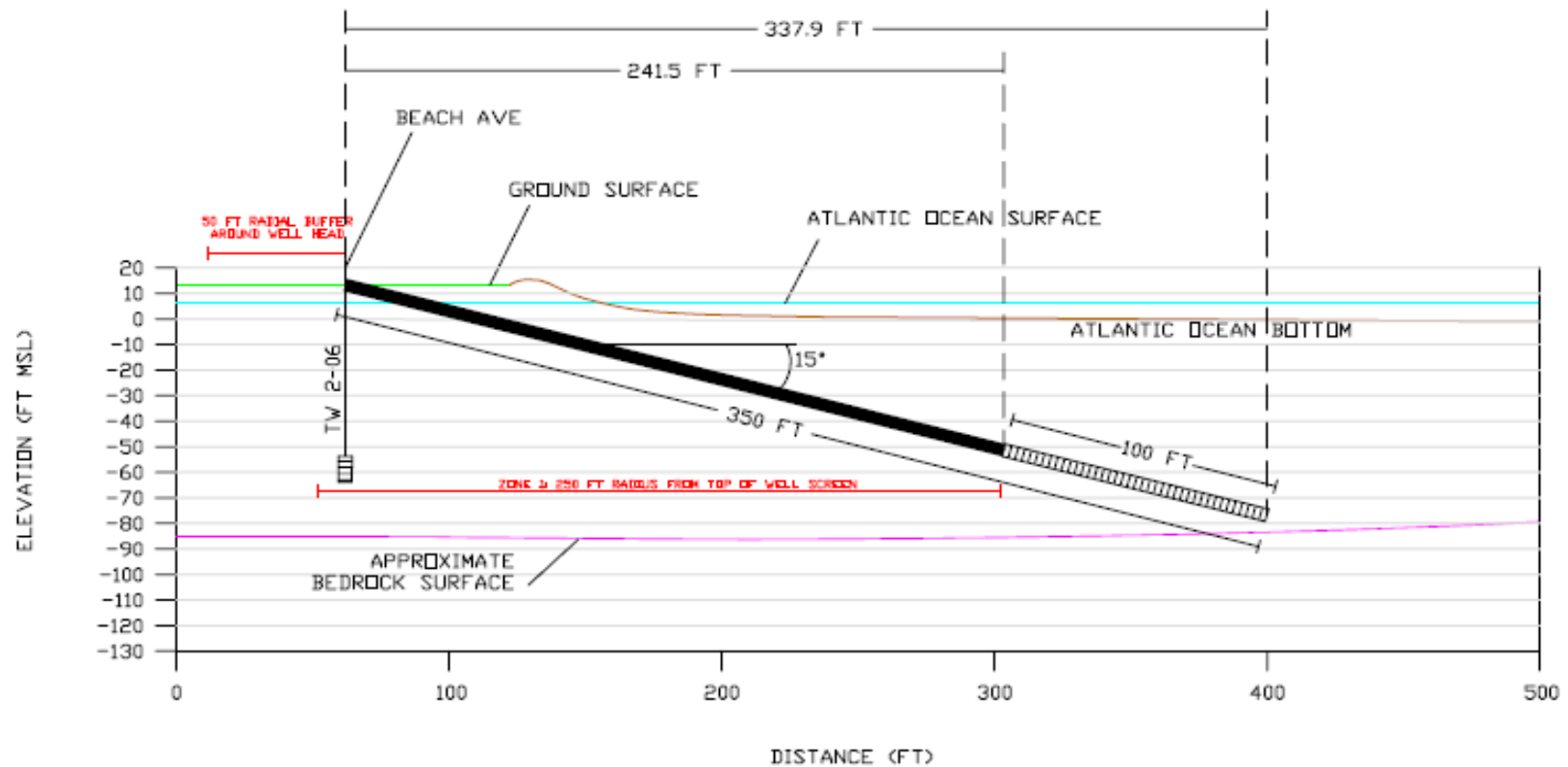
Test Well Exploration



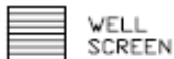
Coarse Gravel



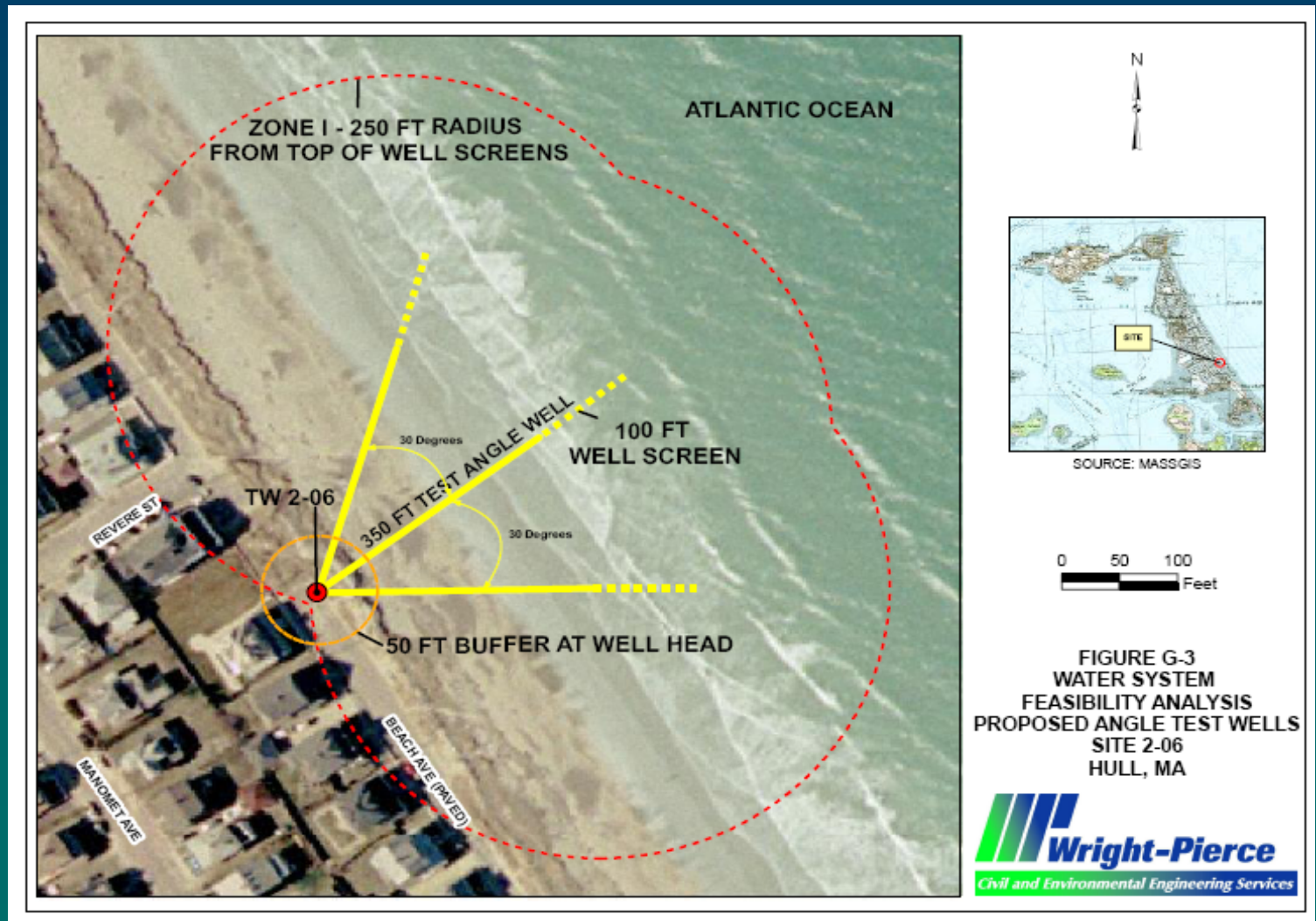
15° Angle Well Beneath Atlantic Ocean



LEGEND



Multiple Well Configuration



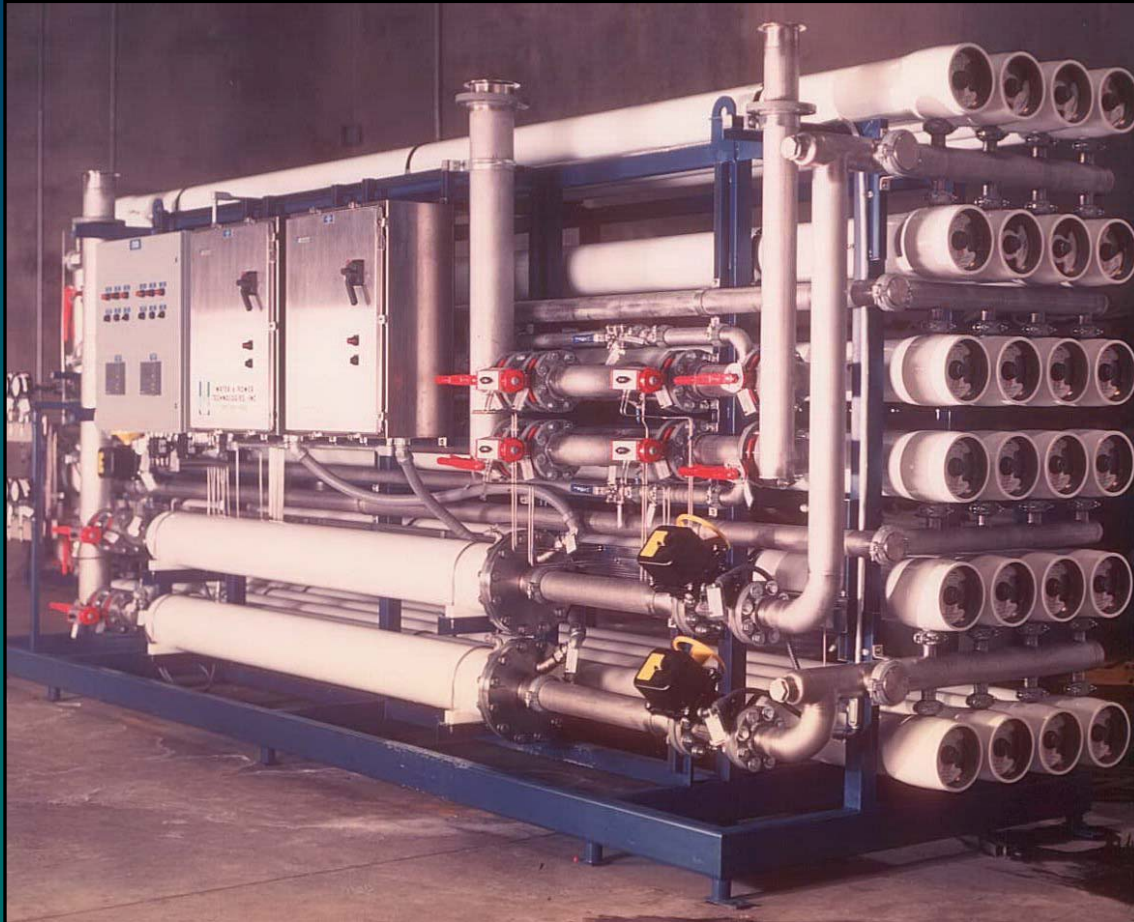
Where Did This Come From?



Common Organisms That Plug Ocean Surface Intakes



Desalination System



TDS

OCEAN

35,000

FINISH WATER 200

Operation & Maintenance Cost

- **\$2.48 Per 1000 Gallons**
- **Does Not Include Capital Cost**



Benefits

- **Reduce Withdrawal From Weir River Watershed**
- **Not An Inter-basin Transfer**
- **Minimize Impacts to Recreational Users, Fisheries and Aquatic Habitat**
- **Consistent Water Quality**
- **Resistant to Contaminant Threats**
- **Eliminate Turbidity, Jelly Fish, Algae that Commonly Foul Filters**

Benefits

- Improved Water Quality Over Direct Ocean Intake - **Red Tide Toxin**
- Reduction In Zone I Radius and Land Acquisition
- Technology Now Approved by DEP
- Low Environmental Impact
- Reduced Permitting and Time
- Lower Project Cost

Many Thanks

- Hull Water Resource Committee
- Municipal Water District Orange County California
- Board of Selectmen Seabrook, NH
- Board of Selectmen Bethlehem, NY



Questions & Comments

Thank you

